AD-A257 964

TECHNICAL REPORT

For The

Cargo Movement Operations System (CMOS)

CMOS Computer Resources Life
Cycle Management Plan (Draft)

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30 November 1992

Prepared under

Contract Number F11624-88-D-0001/6K12

CDRL #A004-154

Prepared for

Standard Systems Center (SSC)
Deputy Chief of Staff for Logistics
Cargo Movement Operations System Division
Maxwell AFB - Gunter Annex, AL 36114

Prepared by

Science Applications International Corporation (SAIC)
5 Eagle Center, Suite 2
O'Fallon, IL 62269

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SECTION I.

INTRODUCTION.

The purpose of this Technical Report is to provide the Draft Computer Resources Life Cycle Manangement Plan (CRLCMP). The results are provided in the form of the attached CRLCMP as requested by the CMOS Program Office.

SUMMARY. Not Used.

CONCLUSION. Not Used.

SECTION II.

RESULTS.

Our input is presented in the attached draft report.

DRAFT COMPUTER RESOURCES

LIFE CYCLE MANAGEMENT PLAN

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List of Figures and Tables

CMOS Computer Resources Life Cycle Management Plan (CRLCMP)

1. Introduction.

a. Overview. The CMOS Computer Resources Life Cycle Management Plan (CRLCMP) serves as the life cycle management document for the development of the Air Force Cargo Movement Operations System (CMOS). CMOS is an Air Force standard information system which provides automated data processing (ADP) support to the Air Force's transportation community. The primary goals of the CRLCMP are to:

(1) Document the computer resources development strategy, the philosophy for life cycle management, and the methodology for development of computer resources;

(2) Document the software support concept and the resources needed to achieve that support posture;

(3) Identify the applicable directives (regulations, operating instructions, technical orders, etc.) for managing computer resources in the CMOS system; and

(4) Define any changes or new directives needed for operation or support of computer resources in CMOS.

b. Scope and Applicability. The CRLCMP is created and updated under the direction of the United States Air Force in response to HQ USAF Program Management Directive (PMD) 5272(4)/ PE #38610F, dated 5 December 1986, as revised 5 June 1992. The PMD directs the development of an automated system to support regular and crisis cargo and personnel processing, documentation, movement and tracking for the base-level Transportation Management Office (TMO).

CMOS has requirements for a two-way data interface with the Standard Base Supply System (SBSS), the Consolidated Aerial Port System (CAPS II), the Stock Control and Distribution System (SC&D), the Air Force Consolidation Containerization Point System (CCP), the Base-Level Transportation Workload Reporting and Productivity System (B-TWRAPS), the Headquarters On-line System for Transportation (HOST), the Computer Aided Load Manifesting (CALM) system, the Department of the Army Movement Management System - Redesign (DAMMS-R), the Terminal Management System/Water Clearance Authority system (TERMS/WCA), and the Air Clearance Authority (ACA) system.

CMOS also has requirements to send data to the Air Force Command and Control System (AFC2S), the Central Data Collection Point (CDCP) system, and the Enhanced Transportation Automated Data System (ETADS), and to receive data from the Combat Ammunition System - Base level (CAS-B), and the Contingency Operations Mobility Planning and Execution System - Base level (COMPES-B).

c. References.

(1) Requirements Documents.

CMOS Operational Requirements Document (ORD) (Draft Final), 28 September 1992.
Information Systems Requirements Document (ISRD) - CMOS, 18 April 1986.

(2) Directives.

CMOS Program Management Directive (PMD) 5272(1)/ PE #38610F, 5 December 1986, as revised 19 December 1991.

(3) Regulations.

DODR 4500.32 Military Standard Transportation and Movement Procedures (MILSTAMP).
AFR 14-1, "Configuration Management", December 1988.
AFR 4-29, "Air Force Data Management and Standards Program", April 1990.
AFR 28-4, "USAF Mobility Planning", 27 March 1987.
AFR 71-4, "Preparing Hazardous Materials for Military Air Shipment".
AFR 71-9, "Air Force Packaging".
AFR 75-1, "Transportation of Material".
AFR 75-2, "Defense Transportation Management Regulation".
AFR 80-14, "Test and Evaluation", November 1986.
AFR 205-16, "Automated Data Processing Security Policy, Procedures, and Regulations".
AFR 310-1, "Management of Contractor Data", March 1983.
AFR 700-10, "Information Systems Security", March 1985.
AFR 800-14, "Life Cycle Management of Computer Resources in Systems", September 1986.

(4) Standards.

DOD 5200.28-STD, "Trusted Computer System Evaluation Criteria", December 1985
DOD-STD-2167A, "Defense System Software Development", February 1988.
DOD-STD-2168, "Defense System Quality Program".
MIL-STD-480B, "Configuration Control Engineering Changes, Deviations and Waivers", July 1988.
MIL-STD-483A, "Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs", June 1985.
MIL-STD-490A, "Specification Practices", June 1985.
MIL-STD-1521B, Notice 1, "Technical Reviews and Audits for Systems, Equipment, and Computer Programs", December 1985.

(5) Plans.

CMOS Communications-Computer Systems Program Plan (CSPP), 1 September 1987.
CMOS Test and Evaluation Master Plan (TEMP) for Increment I, 19 December 1991.
CMOS Integrated Logistics Support Plan (ILSP), undated.

(6) Other Documents.

CMOS System Concept, 24 August 1987.
CMOS Increment I Contract Number GS-OOK-89-AJD0111.
Updated Final (Change 03), System/Segment Specification (SSS), Increment II, 13 December 1991.
Revised Final (Change 02) System/Segment Design Document (SSDD), 13 December 1990.
Revised Final (Change 01) Requirements Traceability Matrix (RTM), 23 December

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1991.
Updated Final Software Requirements Specification (SRS) for the Applications Computer Software Configuration Item (CSCI), 22 February 1991.
Updated Final SRS for the Communications CSCI, 18 January 1991.
Final SRS for the System Environment CSCI, 14 December 1990.
Updated Final Interface Requirements Specification (IRS), 22 March 1991.
Interface Design Document (IDD), Version 2.3.0, 4 September 1992.
Software Design Document (SDD) for the Applications CSCI, Version 2.3.0, 4 September 1992.
SDD for the Communications CSCI, Version 2.3.0, 4 September 1992.
CMOS Monthly Program Status Report, (latest version).

2. System Concepts.

a. Operational Concept. CMOS will support the peacetime and wartime activities of an Air Force base TMO associated with the movement of cargo by any mode, and passengers on military aircraft. CMOS will provide the capability to effectively plan, document, and manage outbound and inbound movements. The system will accumulate and aggregate movement requirements data provided by electronic interface or manual entry; track the completion of transportation actions; prepare, print, and transmit movement documentation to notify en route and destination sites of the movement; and track receipt and distribution activities. The CMOS operational environment is described in the following paragraphs:

(1) CMOS will operate at Air Force active duty, Air Force Reserve, and Air National Guard sites around the world (approximately 203 sites in total). CMOS will be used primarily by TMO personnel. The CMOS configuration depicted in Figure 2-1 provides a representation of the physical environment at most active duty sites, as established by Increment I of CMOS, and the expansion provided in Increment II to support mobility processing. The expansion includes adding the Logistics Applications of Automated Marking and Reading Symbols (LOGMARS) capability and additional Personal Computer (PC) workstations. A total of 15 PC workstations may either be directly connected to the CMOS Local Area Network (LAN) or connected through a Multipoint Attachment Unit (MAU), to be used at the discretion of the TMO to meet workload demands. PC workstations will be moved as required from their peacetime locations to support mobility operations.

(2) The CMOS operational environment will be supported by hardware and software from the Standard Multi-user Small Computer Requirements Contract (SMSCRC), Desktop III, Unified Local Area Network Architecture (ULANA), and LOGMARS contracts. Components from these contracts will be integrated with non-developmental software (NDS), or contractor-developed software.

(3) At all active duty, Air National Guard, and Air Force Reserve sites, one AT&T 3B2/600GR minicomputer from the SMSCRC contract will be used as the TMO host. All host processor units will be connected to Uninterruptible Power Supply (UPS) devices.

(4) The Desktop III microcomputer will be used as the hardware platform for the user interface in each of the functional areas. The MS-DOS operating system will be used to support an ORACLE data base interface to the central processor. The Packing and Crating, Air Freight, Surface Freight, Air Cargo Terminal, and Transportation Control Unit stations will have both laser and dot matrix printers attached. The remaining stations will have only a dot matrix printer.

(5) Components from the ULANA contract will be used to provide the communications path between the host processors and the PC workstations, primarily via an 802.3 compliant Ethernet LAN. The LAN will also be used to access the Defense Data Network (DDN) to provide long-haul communications for CMOS. Both processors will have DDN interface capability, although only one line will be provided to the nearest DDN Concentrator. The line will be switched to the backup processor in the event of failure in the TMO host at sites with two host processors.

(6) CMOS will also use Automatic Digital Network (AUTODIN) in the event of DDN failure, and to interface with those systems which are not yet DDN-capable. Diskette transfer will be accomplished using the Automated Data Reports Submission System
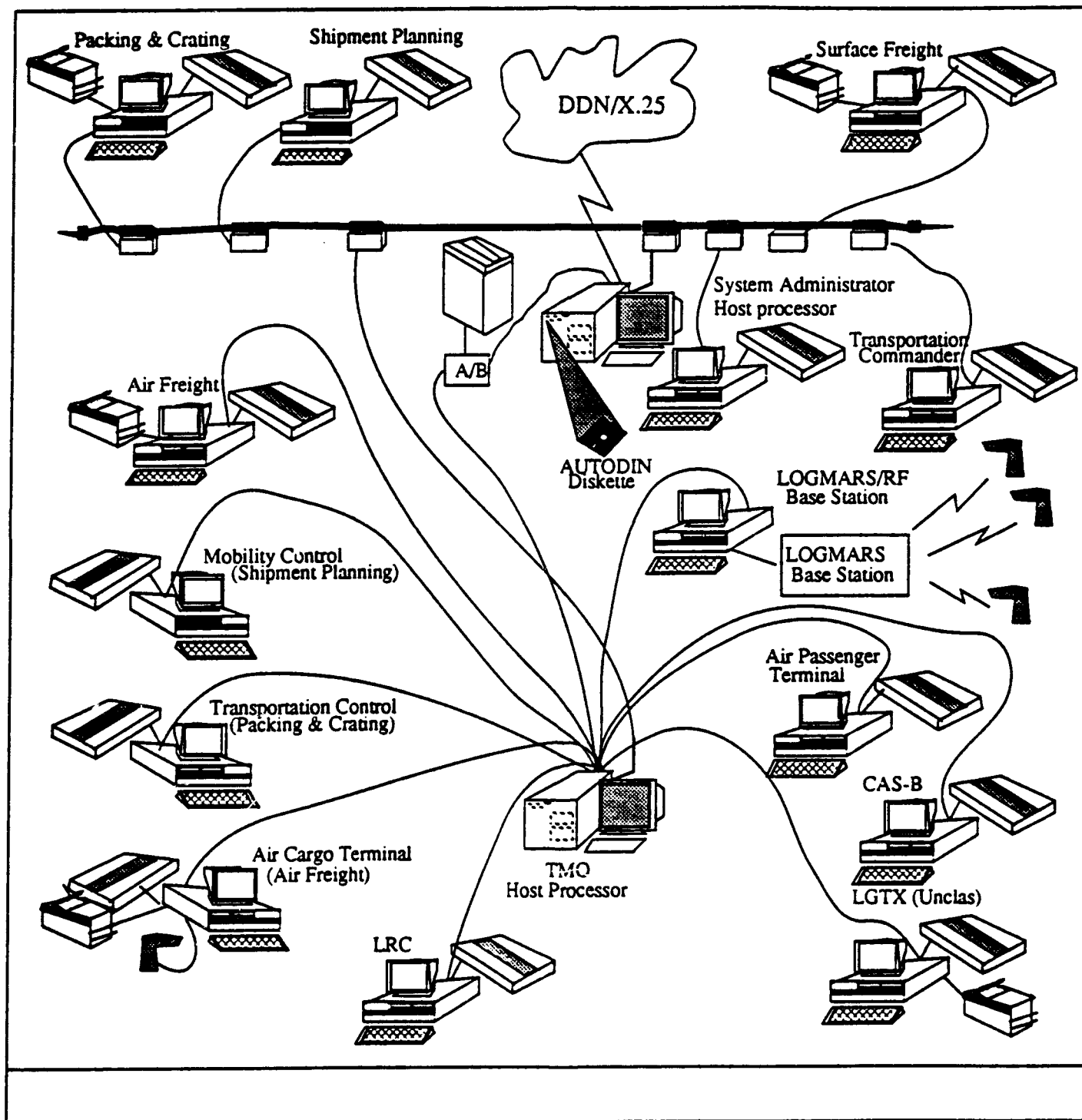
Figure 2-1. CMOS Environment.

(ADRSS) and Base Level AUTODIN Message Extraction System (BLAMES) software.

(7) Transfer of data between CMOS and SBSS will be accomplished using the Interactive Communications Interface (ICI) protocols.

(8) CALM software will be present on those stations that need to do aircraft load planning. Data will be exchanged between CMOS and CALM via the CMOS central data base.

(9) LOGMARS bar code scanning devices will be used for rapid and accurate collection of transportation and shipment data. The LOGMARS Hand Held Terminal (HHT) will be used to update, retrieve, or display data contained within the CMOS data base. Communications between the HHT and the CMOS data base will be either through an RF base station connected through a PC workstation to the CMOS LAN or via cabling directly to any PC workstation on the LAN.

(10) The primary uses of NDS will be to support the central data base and to provide Electronic Data Interchange (EDI)-formatted communications. Specifically, the ORACLE data base, and its associated suite of Structured Query Language (SQL) and support facilities will form the core of the CMOS software. EDI software will allow CMOS users to extract, package, and manage messages to and from EDI trading partners using Transaction Set 858.

(11) Electronic mail will be used to notify the user of MICAP/999 or priority 1 and 2 messages received by the system. Each CMOS user will have the capability to access any of the available functional areas.

(12) There are numerous existing and proposed interfaces to external systems. Changes to these systems will require revisions to the CMOS system functions which manage inbound and outbound data transfers.

b. Support Concepts. The CMOS hardware will be purchased from the standard contracts listed in the preceding paragraph. The hardware will be serviced through a maintenance option from a standard contract or from local maintenance arrangements. Establishment of repair versus replacement criteria is, and will remain, the responsibility of the CMOS SPO. The Integrated Logistics Support Plan (ILSP) makes specific recommendations on repair versus replacement procedures. Logistics support is the responsibility of the CMOS SPO and should be included in the equipment maintenance contract. All expendable supplies will be purchased from standard Air Force contracts. The software support concept is of Type "E" (from AFR 800-14, attachment 8), since Air Force Materiel Command (AFMC) (formerly Air Force Logistics Command (AFLC)) is not responsible for any phase of the software support function.

3. System Description.

a. Overview. The CMOS Increment I software automates the standard functions of the base-level TMO, i.e., packing and crating, shipment planning, and the air freight and surface freight work centers. The CMOS system will allow the transportation activity to automate all of its functions in order to effectively support the variety of missions with which it is tasked. Increment II functions will automate transportation's support of installation-level mobility activities, including deployment, reception, and redeployment of combat forces. Interfaces with additional automated systems beyond those found in Increment I software are also implemented.

The CMOS architecture is composed of four Hardware Configuration Items (HWCIs) and three Computer Software Configuration Items (CSCIs). The functions performed by the Local Area Network, Host Processor, PC Workstation and LOGMARS HWCIs are described in paragraph b. below. Paragraph c. describes the functions of the CMOS Applications, Communications, and System Environment CSCIs.

b. Computer Hardware. Detailed listings of HWCI components may be found in Tables 6-3 through 6-10.

(1) The LAN HWCI will provide the communication path between the Host Processors HWCI components and the PC Workstation HWCI components. The LAN will facilitate the transfer of CMOS functional data, user mail, and other system data throughout the local CMOS system. The LAN will allow the various CMOS users to process cargo in a timely manner and to inform other CMOS users of cargo movements, both on site and outside the local CMOS community.

The LAN will be implemented using ULANA components. The LAN requires Institute of Electrical and Electronics Engineers (IEEE) 802.3 compatible LAN cards, coaxial cable, and a cable-attached transceiver.

(2) The Host Processor HWCI includes the TMO minicomputer, as well as support hardware such as printers and UPS equipment. The host processor will provide the external communications functions, maintenance and control of the central integrated data base, control of the LAN, and restart and recovery functions.

The SMSCRC will provide one AT&T 3B2/600GR minicomputer, currently configured with 32 Megabytes (Mb) of RAM, a 300 Mb system disk and two 300 Mb data base disks. A 120 Mb streaming tape drive will be used for system backup and will support the requirement for data base integrity. An eight-millimeter cartridge-tape backup unit is also available. For large volume reports, the host processors will share an 800 line per minute printer. UPS units will provide 10 minutes of operability to allow a controlled shutdown of the data base.

System external interfaces will either be through an X.25 connection to the local DDN concentrator, or via diskette into AUTODIN.

(3) The PC Workstation HWCI includes the PC itself and directly connected printers. The PC workstations will provide the functionality needed by the Shipment Planning, Packing and Crating, Surface Freight, Air Freight, Outside the Continental United States (OCONUS) ACA, Air Cargo Terminal, Air Passenger Terminal, Mobility Control Unit, Transportation Plans and Programs, Load Planning, Transportation Control Unit and CAS-B work centers to process, document, and report cargo movement. PC workstations will be relocated from their normal peacetime locations and placed in the work centers required to support mobility operations.

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The Desktop III microcomputer will be used as the standard PC Workstation, configured with 4 Mb of Random Access Memory (RAM), and 84 Mb hard drive, one 3.5" 1.44Mb floppy drive, one 5.25" 360 kilobyte floppy drive, and a Video Graphics Array (VGA) color monitor. An Ethernet card will be installed to allow connectivity to the CMOS LAN. Some functional areas will have both a laser printer and a dot matrix printer, while others will have only the dot matrix printer.

(4) The LOGMARS HWCI includes the LOGMARS HHT and scanner. The LOGMARS equipment will be used for rapid and accurate transaction input into the data base, and will be the main input device for tracking cargo movements throughout the TMO facility. The HHT will interface with the PC Workstation through a communications dock connected through an RS-232 port.

The INTERMEC Trakker 9440 Portable Transaction Manager, the INTERMEC Model 1500 Laser Scanner, and the INTERMEC Trakker 40D Communications Dock will be the LOGMARS equipment used.

c. Computer Software. A reference for detailed descriptions of each of the CSCIs may be found in Appendix F.

(1) The CMOS Applications CSCI provides access to, and execution of, all user applications. Functions supported include System Administration, Process Outbound Cargo, Process Inbound Cargo, User Services, Perform Air Passenger Function, Transportation Plans and Programs, and Command and Control Operations.

(2) The Communications CSCI provides all direct communication support for both internal and external communications. Functions provided include the DDN Adapter, AUTODIN Adapter, LAN Adapter, Mail Adapter, ICI Adapter, Incoming Message Manager, and Outgoing Message Manager.

(3) The System Environment CSCI provides Non-Developmental Software (NDS) support to the other CSCIs. System Environment software on the Host Processor HWCI equipment includes the Host Processor OS, TCP/IP WIN/3B software, Office Automation System, High Order Language Interface, Relational Data Base Management System (RDBMS) for the Host, ICI Interface, and EDI software. System Environment software found on the PC Workstation HWCI equipment includes the PC Workstation OS, Net BIOS Interface, Video Drivers software, High Order Language Interface, RDBMS for the PC, LAN PC Interface, Windows software, CALM software, Graphics Software System (GSS) Drivers, Foreign Language Laser Fonts, and OCR Laser Fonts. System environment software resident on the LOGMARS HWCI equipment includes the LOGMARS software.

4. Computer Resource Design.

a. System Architecture and Integration. There are four HWCIs and three CSCIs in the CMOS architecture, as described in paragraph 3 of this document. Refer to Figure 4-1 for a high-level view of how these components are integrated.

CMOS is not an embedded system, and does not have the built-in-test and fault-tolerance functions associated with these types of systems, nor does it have maintenance interfaces or special test equipment, except those used by contract maintenance technicians servicing CMOS hardware.

Since CMOS uses non militarized general purpose commercially available hardware, the requirements of MIL-STD-1750, "Instruction Set Architecture", and MIL-STD-1553, "Standard Bus Architecture", do not apply, as per AFR 800-14, paragraph 3-10 a. A waiver to the requirement for use of Ada as the High Order Language has been approved on the grounds that the C programming language is more fully supported as an interface to the ORACLE RDBMS.

The CMOS software has been divided into three CSCIs: CMOS Applications, Communications, and Systems Environment. "Mission" software, as defined in Attachment 7 of AFR 800-14, has been grouped into the CMOS Applications CSCI. Both the Communications and Systems Environment CSCIs are composed of "support" software, also as defined in Attachment 7 of AFR 800-14.

All CMOS hardware, and all System Environment CSCI software, is Commercial Off The Shelf (COTS) equipment purchased from standard government contracts.

b. Product Improvements. The CMOS architecture is modular in nature, to allow the addition, replacement, upgrade, or deletion of system functions and features without negatively impacting other system functions or features. Increment III of CMOS will be used as the vehicle for Pre-Planned Product Improvement (P^3I) features. Addition of new external interfaces will be the most likely cause of future expansion to the system.

Current memory reserves for the Host Processors are estimated at 7.7 Mb out of 32 available. Memory reserves for the PC Workstations are estimated at 2208 Kb out of 4096 Kb available. The LOGMARS equipment will potentially use all 896 Kb of available memory, with appoximately 755 Kb of that total used for data structures.

Hard disk reserves for the Host Processor are estimated at 40 Mb out of 300 Mb total for the system disk (disk #1), 125 Mb out of 300 Mb for the first data base disk (disk #2), and 140 Mb out of 300 Mb for the second data base disk (disk #3). PC Workstations will have appoximately 27 Mb free out of 84 available.

c. Software Development Tools and Environment. Software development tools will be used in an Engineering Support Laboratory (ESL), and a Development and Test Laboratory (DTL). The ESL is mainly used for analysis and design efforts. The ESL consists primarily of commercially available equipment and software furnished by the development contractor. The DTL consists of Government Furnished Equipment (GFE), Government Furnished Software (GFS), and contractor developed software.

Most of the software environment for the ESL is hosted on Sun workstations running the Sun OS. The Teamwork CASE tool from CADRE Technologies, FrameMaker documentation tool, the ORACLE RDBMS and support products, and a C language compiler are all hosted on the Sun system. RTrace, Lotus 1-2-3, a C language compiler
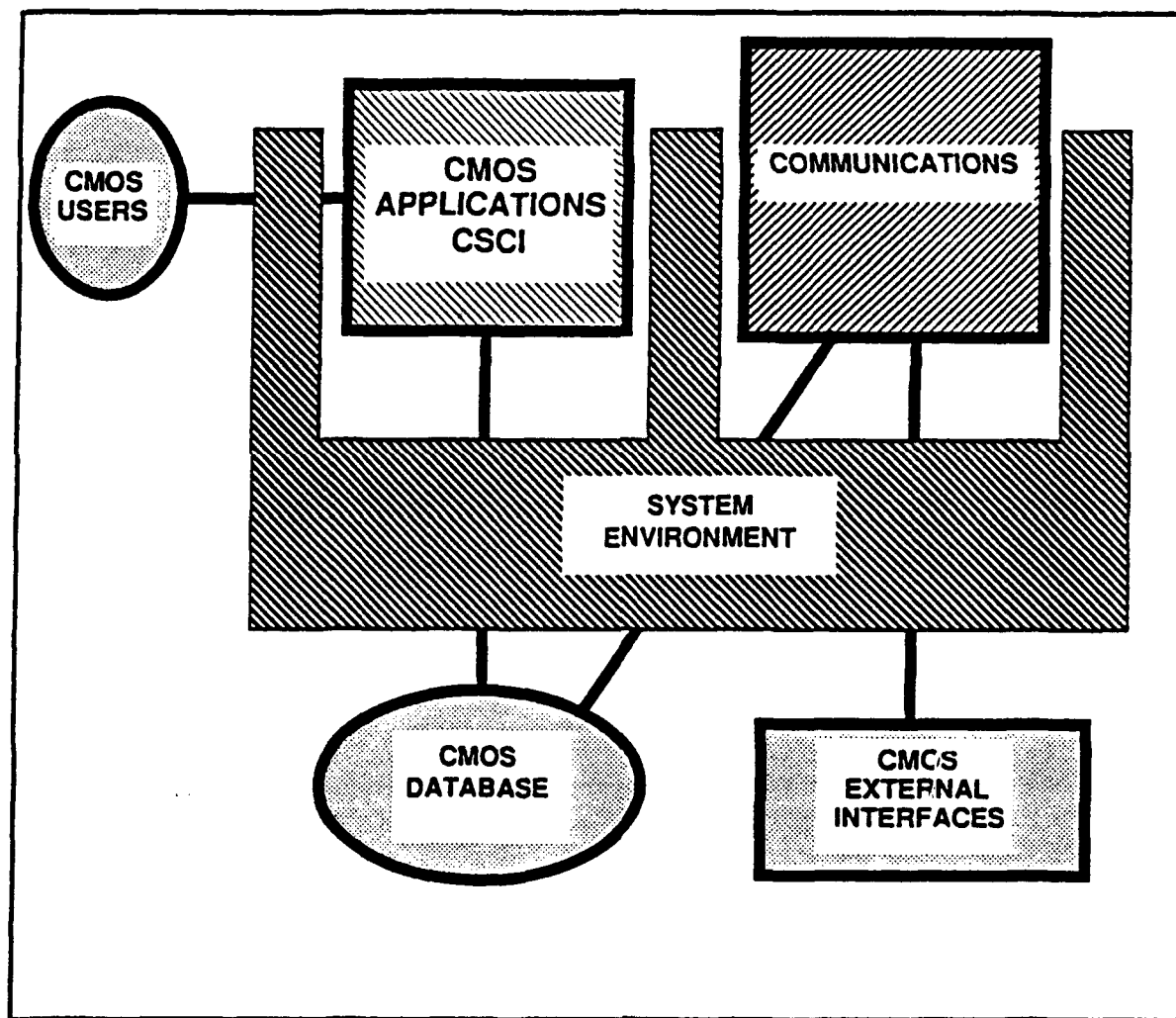
Figure 4-1. CMOS Architecture.

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and an adaptation of the Unix Source Code Control System (SCCS) are hosted on a PC workstation. MacDraw II and MacProject are hosted on an Apple Macintosh.

Teamwork has several modules and applications. Teamwork SA is designed to aid analysts in building, storing, reviewing, maintaining structured reviews, and maintaining DOD-STD-2167A specifications. It handles data flow diagrams, process specifications, and data definitions. It provides consistency checking query functions and total integration to other objects in the data base. Teamwork RT uses decision tables, data control flow, and state transition diagrams to perform real-time modeling of specifications. It provides consistency checking, query functions, and total integration to other objects in the data base (entities, attributes, etc.). Teamwork IM captures entities, relationships, and attributes in the data dictionary for development of Entity-Relationship Diagrams. A consistency checker provides a schema generator to the ORACLE Data Design Language (DDL), relation normalizer, and total integration and interface to other data base objects (data flows, data stores, etc.). Teamwork SD supports structured design methodology and standard notation. It graphically represents the object of design (modules, invocations, couples, and connectors). Design rule checking is provided for completeness and validity based on the software design standards.

The ORACLE RDBMS capabilities include multi-user support, a data dictionary, query optimization, distributed queries, and extensive numeric, text and logical functions. Several support products will be used in conjunction with the ORACLE RDBMS. SQL*Plus is the SQL 4th generation language interface to the ORACLE RDBMS for querying, report writing, and data transferring. SQL*Net allows networking the ORACLE environment. SQL*Forms is a 4th generation tool enabling the user to build forms-based applications and prototypes using a screen painter. SQL*Report formats the results of queries into a report. The report can be formatted by specifying page size, numbering, headers, footers, titles, and field lengths. The data is selected from the data base using SQL*Plus statements. Pro*C is a pre compiler that converts a "C" source program that includes SQL statements into an executable program that can be used to access and manipulate data in an ORACLE data base. SQL*Menu allows design of custom menu-driven interfaces to ORACLE applications. Data base Add-in for Lotus 1-2-3 provides an interface between Lotus 1-2-3 and ORACLE. SQL*Graph allows graphic representations of numerical data that resides in the ORACLE data base to be produced.

FrameMaker is the document publishing system used to create finished deliverables. Output from Teamwork, MacPaint, and MacDraw can be loaded into FrameMaker to produce high-quality deliverables.

The native C compiler provided with Unix operating systems will be used to generate programs for communications interfaces and complex algorithms. A Microsoft C compiler will be used to generate C code on the PC workstations.

RTrace provides the initial step necessary for tracking and managing all requirements. All requirements to the Computer Software Unit (CSU) level are electronically parsed by RTrace, reducing potential errors and saving time. These requirements can then be organized, edited, allocated, traced, and reported.

The Lotus 1-2-3 spreadsheet program is interfaced with the ORACLE RDBMS through the Add-In Manager function to facilitate affinity analysis.

MacDraw and MacPaint are used to produce diagrams and pictures needed to enhance documentation.

MacProject provides the project planning and charting tools to plan tasks, milestones, and events.

d. Reusability. The Government and development contractor will use the automated capability of the CMOS software development environment to capture the requirements analysis, database, and software design information produced during the design of the CMOS system. This will facilitate the reuse of the software modules, data and information gathered during subsequent automation of transportation systems.

e. Interoperability. Within CMOS, access to any function shall be available from any workstation. Access to these functions shall be controlled through the use of password protection, not location. In addition, any PC Workstation hardware shall be interchangeable with any other PC Workstation, provided that necessary resident data has been uploaded before the interchange takes place. Interoperability with systems external to CMOS will be facilitated by use of hardware and software purchased from government standard contracts wherever possible. In addition, use of the DDN and AUTODIN networks to communicate with external systems relieves CMOS of the responsibility of negotiating unique data transfer protocols.

f. Additional Design Constraints. In general, the mandated use of GFE and COTS software from the SMSCRC, ULANA, LOGMARS, and Desktop III contracts imposes constraints on the overall design of CMOS. In addition, there is a conflict between the CMOS software and the CALM load planning software on the PC Workstation HWCI . When the CALM software is executed, the PC is automatically rebooted by CALM. This action causes conditions to occur within the PC's memory that will not allow the ORACLE software to restart without resetting the PC's memory (i.e., a warm boot of the system). As a result, users requiring a CALM-generated load list must select data for input to load planning, download the data to the PC, and receive a load list from the load planning software, and upload the load list to the Host Processor.

5. Organizational Roles, Responsibilities, and Relationships. PMD 5272(4)/PE #38610F, designates Air Force Communications Command (AFCC) as the implementing command for the CMOS Program. Responsibilities for the program were further delegated to the CMOS System Program Office (SPO), SSC/LGTT. The CMOS SPO is responsible for contractors used to develop the CMOS system. The SPO will contract for the analysis and development of the CMOS standard systems. The SPO will also contract for Independent Verification and Validation (IV&V) efforts and technical support services (to include technical evaluations, requirements analysis, cost management, and other support of the mission as required). Organizational roles, responsibilities, and relationships of the Implementing Command, Supporting Commands, Operating Commands, Participating Commands, and Other Agencies/Offices are detailed in the PMD.

6. Resources:

a. **Personnel.** Air Force personnel requirements are detailed in Figure 6-1.

b. **Facilities.** The CMOS SPO will maintain a laboratory with the most current hardware and software configuration. This facility will be connected to the ESL and the Development and Test Laboratory (DTL) maintained by the development contractor via a T-1 communications link. See Figure 6-2 for a representation of the facilities to be used in developing, testing, and supporting CMOS computer resources.

c. **Training.** No special training is to be provided by the government in support of developing, testing and supporting the computer resources.

d. **Hardware.** CMOS hardware will be provided from standard computer acquisition contracts such as the SMSCRC, the Desktop III Small Computer Contract, the ULANA Contract, and the LOGMARS Contract. A description of the items needed to support CMOS is provided in Figures 6-3 through 6-6. In addition, the development contractor will use Sun workstations and Macintosh personal computers to support the development of CMOS, as described in paragraph 4.c.

e. **Software.** CMOS will use the following software development tools:

1. DOS Version 5.0 - used for all CMOS DOS batch processing to accomplish a variety of tasks. These processes will execute in background mode.

2. Unix System V Shell Scripts - used on the Host processors to accomplish a variety of tasks. These processes will execute in background mode.

3. ORACLE SQL*Plus Scripts - used to perform a variety of tasks related to the ORACLE RDBMS.

4. ORACLE SQL*Forms - used to construct user screens for CMOS.

5. ORACLE SQL*ReportWriter - used to implement CMOS requirements that call for the generation of reports based on CMOS data.

6. Microsoft C Version 5.1 - used to supplement the ORACLE suite of products on the PC workstation when CMOS requirements cannot be met by use of those products alone.

7. C language compiler provided with AT&T UNIX System V - used to supplement the ORACLE suite of products on the Host Processor when CMOS requirements cannot be met by use of those products alone.

8. IRL Programming Language - used for coding the CMOS LOGMARS processes.

9. PRESCRIBE Programming Language - The PRESCRIBE programming language will be used to provide CMOS users with system-generated forms on the CMOS Kyocera laser printers.

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LGTT          CMOS
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BY SPECIALTY			TOTALS			
AFSC	AGR	GRD				
06016	MAJ	MAJ	MANAGEMENT 1	OFFICERS		1
70250	CIV	GS05	TECHNICAL	0	ENLISTED	0
			FUNCTIONAL	0	CIVILIANS	1
			SUPPORT	1	TERMS	0
					TOTAL AUTHORIZED	2

SUBORDINATE SUPERVISORY PERSONNEL		2

```
LGTTF         FUNCTIONAL REQUIREMENTS
```

BY SPECIALTY			TOTALS			
AFSC	AGR	GRD				
06054	CPT	CPT	MANAGEMENT 3	OFFICERS		2
02754	CPT		TECHNICAL	0	ENLISTED	3
06054	CIV	GS12	FUNCTIONAL	6	CIVILIANS	4
06054	CIV	GS12	SUPPORT	0	TERMS	0
06054	CIV	GS12			TOTAL AUTHORIZED	9
06054	CIV	GS12				
60299	SMS	MSG				
60273	TSG	MSG				
60273	TSG	MSG				

TOTAL PERSONNEL SUPERVISED		8

```
LGTTS         SYSTEMS ENGINEERING
```

BY SPECIALTY			TOTALS			
AFSC	AGR	GRD				
04925	CIV	GM13	MANAGEMENT	10	OFFICERS	2
02724	CPT	CPT	TECHNICAL	6	ENLISTED	4
02724	MAJ	CPT	FUNCTIONAL	0	CIVILIANS	3
04925	CPT	CPT	SUPPORT	2	TERMS	0
04925	CIV	GS12			CONTRACTORS 70	
04925	CIV	GS12			TOTAL AUTHORIZED 79	
49152	SSG	SSG				
70250	SSG					
49132	A1C	A1C				
70250	AMN	AMN				

TOTAL PERSONNEL SUPERVISED		78

Figure 6-1. CMOS Unit Manpower Document (UMD) Summary.
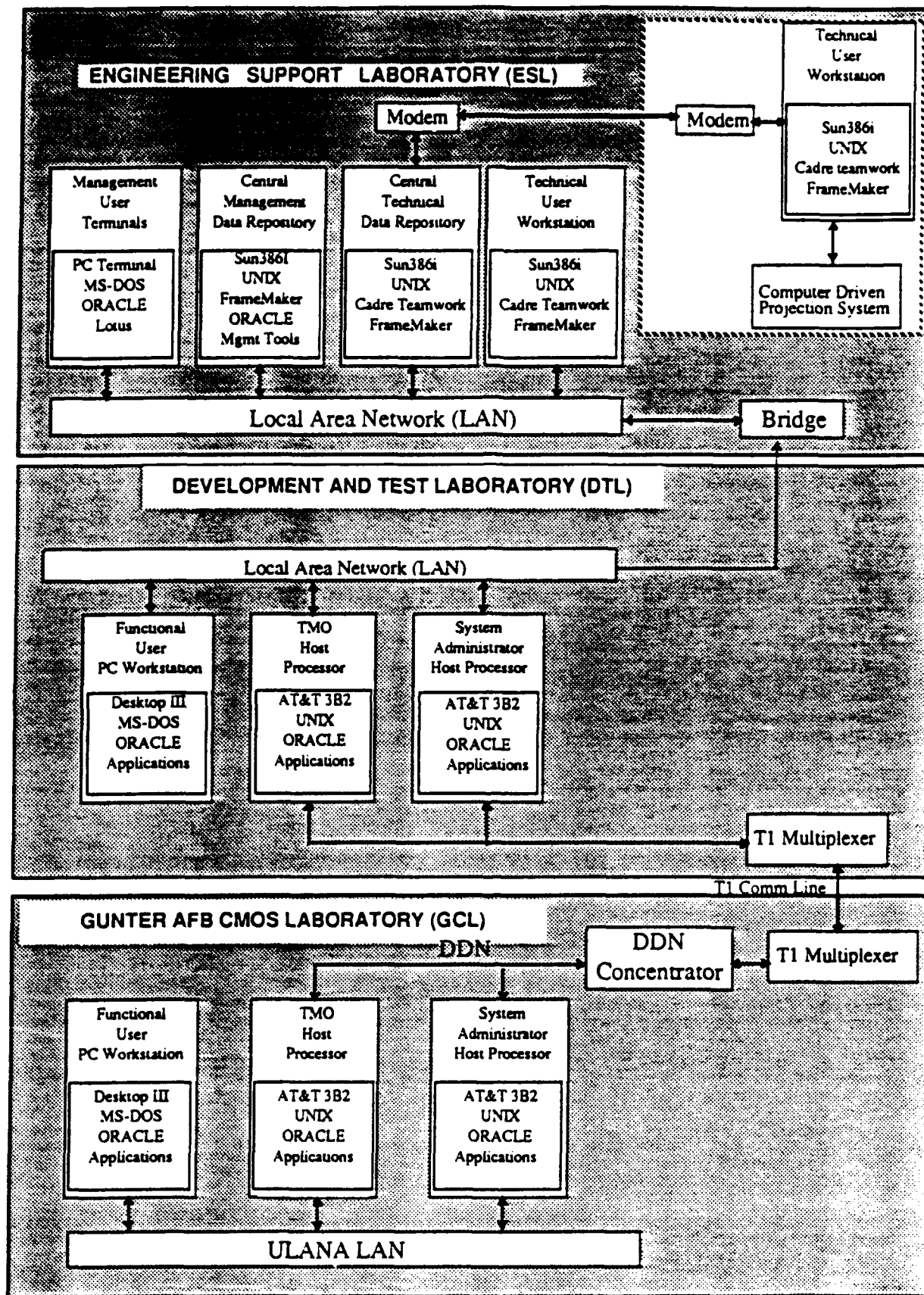
Figure 6-2. Software Development Environment.

ITEM		Dual Processor Site	Single Processor Site
0001AA	AT&T 3B2/600G	2	1
0002AC	4MB RAM CARD W/ECC	4	2
0004AA1	AT&T 3B2 EPORTS BOARD	4	2
0005AB	300MB RMVBLE DISK DRIVE, EXT	4	2
0005EA	300MB NON-RMVBLE DISK DRIVE	2	1
0005PA	HARD DISK CABINET	1	1
0005RC	CADS CABLE	1	1
0007AA	HIGH SPEED LINE PRINTER	1	1
0007AC	HIGH RES, NON-IMP PRTR (LASER)	2	1
0004EA	AT&T 3B2 10BASE5 NI FEATURE	2	1
0004EC	10 FT. DROP CABLE, MALE/FEMALE	7	4
0004EE	ST 500 TRANCEIVER (IEEE 802.3)	7	4
0010DA	25 FT. RS232 CABLE (DTR M)	8	2
0010AT	MODEM RACK AND CASE	1	1
0010AX	MODEM CARD, LIMITED DISTANCE	7	3
0012AA	3B2/600 OPERATING SYSTEM (UNIX)	2	1
0015AA	TCP/IP WIN/3B DEFENSE NETWORK	2	1
0010DG	25 FT. RS232 CABLE (TERM/P)	2	1
0003AA	605G DISP (NON-TEMP CONSOLE)	2	1
0001BC	22 MHZ 32200 SYSTEM BOARD	2	1
0004JA	PC IEEE 802.3 INTERFACE KIT	7	4
0010DE	RS232 MODEM CABLE (ACU/MO)	14	8
0015CA	NETBIOS INTERFACE, 3B2/600G	2	1
0017RA	OFFICE AUTOMATION SYSTEM	2	1
0001DA	RACK MOUNT HARDWARE	2	1
0010AB	MODEM LD STD ALONE	2	1
0004DC	DDN X.25/RS232C PORT (19.2KB)	2	1

ITEM	DESCRIPTION	Increment II
0004EC	10 FT. DROP CABLE, MALE/FEMALE	9
0004EE	ST 500 TRANCEIVER (IEEE 802.3)	9
0010DA	25 FT. RS232 CABLE (DTR M)	9
0010AX	MODEM CARD, LIMITED DISTANCE	7
0004JA	PC IEEE 802.3 INTERFACE KIT	9
0010DE	RS232 MODEM CABLE (ACU/MO)	18

Figure 6-3. Host Processor Components.

DESKTOP III

ITEM	DESCRIPTION	Dual Processor Site	Single Processor Site
0002AB	ADVANCED COMPUTER SYSTEM (includes 4 MB Memory and Serial/Parallel Ports)	7	4
0003AB	14" VGA MONITOR	7	4
0003AE	VGA VIDEO BOARD	7	4
0006AB	INTERNAL 5.25" FLOPPY DISKETTE	7	4
0007AB	84 MB SCSI INTERNAL HARD DRIVE	7	4
0011AA	DOT MATRIX/LQ PRINTER	7/3	4/2
0015AJ	LAN INTERFACE CARD	7	4
0015AK	LAN INTERFACE TRANSCEIVER	7	4
0015AL	MS-DOS ETHERNET/NETBIOS SOFTWARE	7	4
0015AQ	50' TRANSCEIVER CABLE	7	4
0023AA	MS-DOS 4.01	7	4

DESKTOP III

ITEM	DESCRIPTION	Increment II
0002AB	ADVANCED COMPUTER SYSTEM (includes 4 MB Memory and Serial/Parallel Ports)	9
0003AB	14" VGA MONITOR	9
0003AE	VGA VIDEO BOARD	9
0006AA	INTERNAL 3.5" FLOPPY DISKETTE	9
0006AB	INTERNAL 5.25" FLOPPY DISKETTE	9
0007AB	84 MB SCSI INTERNAL HARD DRIVE	9
0011AA	DOT MATRIX/LQ PRINTER	9/2
0015AJ	LAN INTERFACE CARD	9
0015AK	LAN INTERFACE TRANSCEIVER	9
0015AL	MS-DOS ETHERNET/NETBIOS SOFTWARE	9
0015AQ	50' TRANSCEIVER CABLE	9
0023AA	MS-DOS 4.01	9

Figure 6-4. PC Workstation Components.

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ULANA			
ITEM	DESCRIPTION	Dual Processor Site	Single Processor Site
B02	HAU-IBM AT/Desktop III/DOS (or AT&T 0004AJ3)	3	3
B08	BASEBAND 10BASE5 MAU	3	3
B14	AAU5-16 PORT (or AT&T 0004AJ3)	1	
B33	TRANCEIVER CABLES	3	3

ULANA		
ITEM	Dual Processor	Single Processor
B02 HAU-IBM AT (Desktop III/DOS)	9	5
B08 BASEBAND 10BASE5 MAU	11	6
B14 AAU5-16 PORT	1	
B33 TRANSCEIVER CABLES	11	6

Figure 6-5. ULANA Components.

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LOGMARS			
ITEM	DESCRIPTION	Dual Processor Site	Single Processor Site
1004AA	BAR-CODE SCANNER	3	2
1001AC	PDCD TRAKKER 9400	3	3
1001MA	NICAD BATTERY CHARGER	3	2
1001NA	NICAD BATTERY PACK	6	4
1012AA	PORTABLE BAR-CODE ANALYZER	1	
1001CD	PORT CONCENTRATOR	3	2
1010MC	ASYNC-ASYNC CABLE Z-248	3	2
1001QB	EPROM, 64KB	6	4

Figure 6-6. LOGMARS Components.

f. Integrated Logistics Support (ILS). An ILSP has been developed for the CMOS program. The ILSP is an Air Force management plan developed and used to manage the ILS process. This includes the horizontal integration of the ILS elements as well as their vertical integration into the various aspects of the program planning, engineering, designing, testing, and evaluation both during production and operation. It also includes the integration of support elements with the mission elements of a system throughout its life cycle. All participating activities are required to comply with the ILSP after it is coordinated with the using, supporting, training, and participating commands and approved and published by the program management activity within the implementing command.

7. Documentation.

a. Types of Documents. Program documentation includes all documents produced under contract for the CMOS program. Specifically, this includes CMOS hardware and system software documents produced under the development contract. These documents are categorized as development, testing, and supporting documentation. Specific listings and copies of these documents are archived in the reference library at the system program office facility.

(1) Development Documentation. Development documents are considered to be the documents used to collect the user's basic functional requirements, to analyze the requirements, to integrate the requirements into a set of CMOS requirements, and to develop and propose potential ADP system solutions. The documents listed below are the CMOS documents required to capture and analyze CMOS requirements:

    (a)   Operational Requirements Document (ORD).

    (b)   Systems/Segment Design Document (SSDD).

(2) Testing Documentation. Testing documents are considered to be the documents used to collect and develop test plans and procedures to test design unit specifications and to verify operational effectiveness. The documents listed below are the CMOS documents required to develop and test design unit specifications for a specified target area:

    (a)   Software Test Description (STD).

    (b)   Software Test Plan (STP).

    (c)   Software Test Report (STR).

(3) Software/Supporting Documentation. Supporting documents are considered the documents used for software development and for development of life cycle support for the deployed design unit. The documents listed below are the CMOS and DOD 2167A documents required to develop effective and efficient software and supporting life cycle documentation for a specified target area:

    (a)   Interface Requirements Specifications (IRS).

    (b)   Software Requirements Specifications (SRS).

    (c)   Software Design Document (SDD).

    (d)   Users Manual (UM)

    (e)   Version Description Document (VDD).

    (f)   Operator's Manual (OM).

b. Data Rights. The government will have unlimited and unrestricted rights (as defined in DOD FAR Supplement 52.227-7013, "Rights in Technical Data and Computer Software") to all data, documentation, and software developed and provided under the CMOS

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development contract. The government will have Standard Commercial Business Practice data rights for COTS software and hardware items. The implementing command (SSC/LGTT) will maintain appropriate licensing and subscription services thoughout the life of the system.

c. Data Management. Documentation is prepared using automated text processing and graphics capabilities supporting the Software Development Library (SDL). When documentation is ready for formal review and approval, master media are physically controlled by the configuration management activity. Only those changes authorized by designated responsible persons will be permitted. Documents will be provided to the government for analysis by electronic transmission or recorded media as specified in the contract. Documentation is released as engineering documentation with all the safeguards required for corporate and contractual records.

A document release record is prepared for each controlled document maintained in the SDL for CMOS. The record identifies each document by identifier and title. It contains the initial released document revision level and date of issue. The record is updated to reflect the approval of each change or release of subsequent revision levels. This record contains the following:

  a. System name (CMOS)

  b. Project ID (e.g., Incr or Mgmt)

  c. Contract Data Requirements List (CDRL) (e.g., A031)

  d. Contract Line Item Number (CLIN)

  e. Document title (e.g., Updated Configuration Management Plan)

  f. Version Name

  g. Scheduled Date

  h. Author

  i. Reason Delivered

  j. Current Status

  k. Publication Date

  l. Delivery Date

  m. Acceptance Date

  n. Acceptance Status

  o. Document Control Number (e.g., 3599CMP*027*.05)

p. Library Storage Location

8. Acquisition Management Practices.

a. Software Development Strategy. The CMOS program will use a combination of DOD-STD-2167A and Information Engineering (IE) techniques. The IE techniques produce a data-driven system which limits redundancy through data standardization and normalization. The data-driven method provides a stable data structure which promotes the ease of building incrementally. This methodology supports a system engineering approach for capturing requirements which are effectively allocated to hardware and software. This approach produces a system design which balances trade-offs between computer hardware, software, and communications. The life cycle of the CMOS program is shown in Figure 8-1.

b. Boards and Committees.

(1) Configuration Control Board (CCB). The CCB is composed of representatives from CMOS program functional areas, SSC support agencies, and participating commands. The CMOS Program Manager or his designated representative will chair and direct each CCB meeting. The procedures for this board are defined in the Configuration Management Plan (CMP).

    (a) Responsibilities.

        1) Configuration control of CMOS software and hardware developed or acquired during CMOS development.

        2) Manage established baselines.

        3) Act on proposed changes to baselines.

        4) Review and validate all program impacts by approving or disapproving proposed changes to an approved baseline.

        5) Establish and implement priorities.

        6) Provide configuration management guidance and direction to operating commands.

    (b) Interfaces.

        1) Evaluate proposed changes pertaining to cost, schedule, or baseline submitted by the government and/or contractor.

        2) Provide Major Command (MAJCOM) Software Configuration Control Sub-Boards guidance.

(2) Computer Resources Working Group (CRWG). The CRWG is composed of representatives from CMOS program functional areas, SSC support agencies, participating commands, supporting commands, and operating commands. The chairman of the CRWG is the CMOS Program Manager (SSC/LGTT), who will coordinate and direct each CRWG meeting. Specific responsibilities for the CRWG are described in the CRWG charter contained in Appendix D of this document.

(3) Interface Control Working Group (ICWG). The ICWG serves as the official communications link between program participants to resolve, document, and
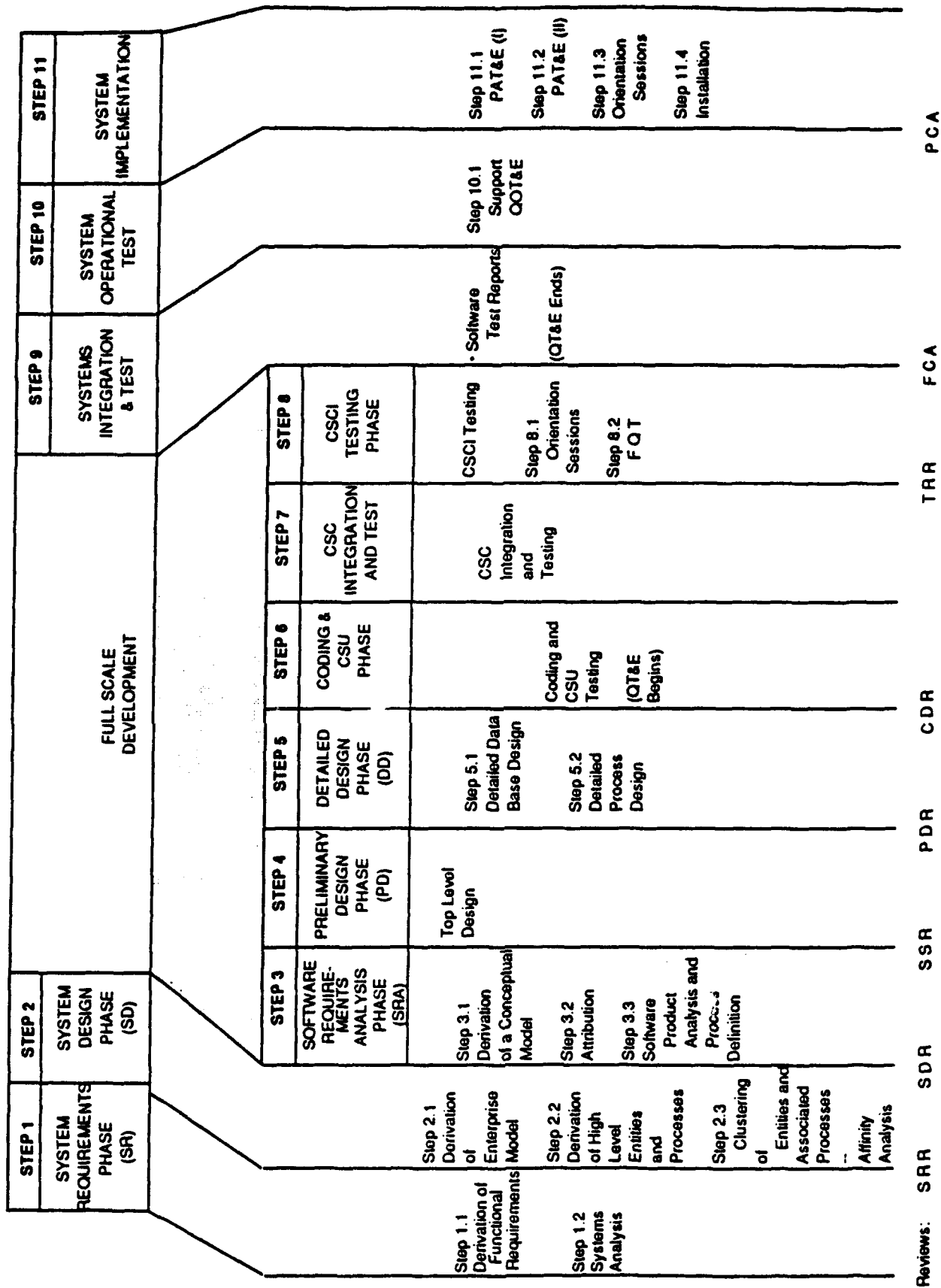
CMOS LIFE CYCLE

Figure 8-1. CMOS Life Cycle.

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coordinate external interface matters with other major programs such as SBSS and CAS-B. Procedures for the ICWG are contained in the Configuration Management Plan (CMP).

(4) Computer Security Working Group (CSWG). The CSWG is chartered as an advisory forum with organizational and computer systems security expertise. The purpose of the CSWG is to provide the CMOS program with a review of security policy, design, and implementation strategies.

c. Configuration Management.

(1) Governing Directives. See Section 1 for applicable directives.

(2) Special Procedures.

(a) Contractor Tasks. Task orders are used to request the contractor to perform development activities. The contractor is responsible for configuration management of the software development process. The Software Development Plan (SDP) will be the document used to evaluate and monitor the contractor's configuration management procedures. The contractor will notify the government of all Class I and Class II engineering changes to baselines. Class I changes that affect Government controlled established baselines will require the contractor submitting an Advanced Change/Study Notice (ACSN). The ACSN will be reviewed by the Government and if approved, will authorize the contractor to prepare an Engineering Change Proposal (ECP). Detailed procedures for processing ACSNs and ECPs are found in the contract and the CMOS CMP.

(b) Development. The contractor is responsible for the development configuration during the development phase. The software development process will follow the procedures detailed in DOD-STD-2167A as tailored to meet the requirements of this contract. The software development steps are followed by specific reviews which must be completed before proceeding to the next step. The details of each review are found in MIL-STD-1521B.

d. Documentation Review or Approval.

(1) Governing Directives. See Section 1 for applicable directives.

(2) Special Procedures. The program office is responsible for receiving and distributing documents produced under the CMOS development contract. A reference library is maintained at the system program office facility. In addition, the Data Management office in the SSP branch will maintain a repository of all data deliverables. During the development phase of the program, data deliverables will be prepared and distributed in accordance with the appropriate Data Item Deliverables (DIDs), CDRLs, and task orders. Procedures for receipt, review, and acceptance of the data are contained in the CMOS CMP.

e. Reviews and Audits. The following reviews and audits will be conducted to evaluate and assess work to date and authorize work to continue.

(1) System Requirements Review (SRR). The purpose of the SRR is to present the

(1) System Requirements Review (SRR). The purpose of the SRR is to present the development contractor's understanding of the system requirements and to receive feedback concerning the preliminary System/Segment Specification.

(2) System Design Review (SDR). At the completion of the System Design phase a System Design Review will occur. The SSDD, Preliminary SRS, RTM, and Updated SDP will be provided to the review committee prior to the review. This review will evaluate the allocation of the technical requirements, previously defined in the SSS, to hardware, software, and communications. The review committee will evaluate the process used to develop the allocation along with the risks associated with the system design. The Fu... .ional Baseline is established at the successful conclusion of the SDR.

(3) System Specification Review (SSR). At the completion of the Software Requirements Analysis phase the SSR will occur. The SRSs, IRSs, updated RTM and SDP will be provided to the review committee prior to the review. This review will ensure that system requirements have been properly allocated to software units. The Allocated Baseline is established at the successful conclusion of the SSR.

(4) Preliminary Design Review (PDR). At the completion of the Preliminary Design phase, the top level design will be reviewed in the PDR. All products will be provided to the review committee prior to its convening. The PDR will ensure that the developer has prepared all appropriate documentation. In addition, the developer will present all software quality evaluation findings from the Preliminary Design Phase.

(5) Critical Design Review (CDR). The objective of the CDR is to determine whether the design adequately addresses all the performance and interface requirements of the configuration item. This is a technical review prior to the beginning of coding and will be conducted prior to detail design release.

(6) Test Readiness Review (TRR). The TRR will review the readiness of all testability aspects of the contractor's development effort. The satisfactory conclusion of the review indicates the developer's readiness to begin CSCI testing.

(7) Functional Configuration Audit (FCA). The objective of the FCA is to verify that the configuration item's actual performance complies with the approved software functional requirements.

(8) Physical Configuration Audit (PCA). The objective of the PCA is to verify that the configuration item "as built" conforms to the technical documentation which defines the configuration item. The Product Baseline is established at the successful conclusion of the PCA.

(9) Formal Qualification Review (FQR). The objective of the FQR is to analyze a group of configuration items comprising the system to ensure they have met specific contracting agency contractual performance requirements (specifications or equivalent).

f. Test and Evaluation. Test and evaluation can be broken down into two main phases, Qualification Test and Evaluation (QT&E) and Qualification Operational Test and Evaluation (QOT&E), supported by review points. A brief summary of QT&E and QOT&E is described below. For additional information refer to the CMOS Test and Evaluation Master Plan (TEMP).

(1) Qualification Test and Evaluation (QT&E). QT&E will be conducted to determine if the designed system meets its specifications. QT&E I will be used to accomplish coding and unit testing, computer software configuration item (CSCI) testing, and system integration testing. QT&E II will test the system in a "field" environment prior to operational testing performed by outside agencies.

(2) Qualification Operational Test and Evaluation (QOT&E). QOT&E will be conducted to determine the system's operational effectiveness and suitability. This testing will be accomplished in as close to an operational environment as possible by an independent test agency. QOT&E will utilize actual operations and maintenance personnel for conducting the testing.

(3) TRR. Testing will be supported with a test readiness review to determine if the system is ready to proceed to the next level of testing. It will be accomplished before formal CSCI testing begins (refer to Figure 8-1). Achievement of a satisfactory FCA, PCA and FQR prior to QOT&E will provide the basis for the Program Manager to certify that the system is ready to begin QOT&E.

g. **Software Quality.** Software Quality Evaluation (SQE). The SQE will provide the program manager a means to determine that the system and its components meet quality assurance (QA) requirements. QA is vital in the identification and measurement of product quality degradation and reduces the possibility that production and/or acceptance of defects will occur.

h. **Security.**

(1) General. Security for the CMOS program will conform with AFR 205-16 and other applicable DOD and Air Force directives.

(2) Computer Security. All CMOS-acquired Automated Data Processing Equipment (ADPE) shall conform with the ADP security requirements of DOD Standard 5200.28.

9. Transition Management Practices.

  a. Configuration Management.

    (1) Configuration Management (CM) is a formal management process to be applied to the CMOS Program. The CM function includes identification of hardware and software configuration items (design units), change control, configuration status accounting, reviews and audits.

    (2) Configuration Management Concept .

        (a) The CMOS CMP details CMOS CM policies and procedures. The CMP identifies the disciplines necessary to establish baseline characteristics and control changes. Baselines will be employed throughout the development process to ensure an orderly transition from one major commitment point to the next. As new requirements or changes to the baselined configuration items (CIs) are identified, they will be evaluated for program impact. A CCB will analyze the impact of each proposed change and make a recommendation to the Program Manager. Interface control policies and procedures will be established as needed.

        (b) Selected configuration status reports will be maintained to identify the history and status of each CI and all changes thereto.

        (c) Reviews and audits will provide program visibility as well as help to assure that the contractor provides a quality product.

b. Turnover. Responsibility for CMOS will remain with SSC/LGTT for the intended life of the system.

c. Support During Transition. This paragraph does not apply to CMOS since no transition is planned for the system.

d. Transfer. No transfer of computer resources is planned for CMOS.

10. Deployment Management Practices.

a. Boards and Committees.

(1) Configuration Control Board. The CCB is composed of representatives from CMOS program functional areas, SSC support agencies, and participating commands. The CMOS Program Manager or his designated representative will chair and direct each CCB meeting. The procedures for this board are defined in the CMP.

(a) Responsibilities.

1) Configuration control of CMOS software and hardware developed or acquired during CMOS development.

2) Manage established baselines.

3) Act on proposed changes to baselines.

4) Review and validate all program impacts by approving or disapproving proposed changes to an approved baseline.

5) Establish and implement priorities.

6) Provide configuration management guidance and direction to operating commands.

(b) Interfaces.

1) Evaluate proposed changes pertaining to cost, schedule, or baseline submitted by the government and/or contractor.

2) Provide MAJCOM Software Configuration Control Sub-Boards guidance.

(2) Computer Resources Working Group. The CRWG is composed of representatives from CMOS program functional areas, SSC support agencies, participating commands, supporting commands, and operating commands. The chairman of the CRWG is CMOS Program Manager (SSC/LGTT), who will coordinate and direct each CRWG meeting. Specific responsibilities for the CRWG are contained in the CRWG charter contained in Appendix D of this document.

(3) Interface Control Working Group. The ICWG serves as the official communir ions link between program participants to resolve, document, and coordinate external interface matters with other major programs such as SBSS and CAS-B. Procedures for the ICWG are contained in the CMP.

(4) Computer Security Working Group. The CSWG is chartered as an advisory forum with organizational and computer systems security expertise. The purpose of the CSWG is to provide CMOS with a review of security policy, design, and implementation strategies.

b. Configuration Management. See Section 1 for applicable directives.

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c. Security.

(1) General. Security for CMOS program will conform with DOD Directive 5200.28, DOD 5200.1-R/AFR 205-1, DOD 5220.22-R/AFR 205-4, AFR 205-16, and other applicable DOD and Air Force directives.

(2) Computer Security. All CMOS-acquired ADPE shall conform with the ADP security requirements of DOD Directive 5200.28, DOD 5200.28-M, DIAM 50-4, and AFR 205-16. The Trusted Computer System Evaluation Criteria, CSC-STD-001-83, may apply and will be used as appropriate.

(3) Physical Security. The system physical security for CMOS will be performed in accordance with AFR 205-16. MAJCOM sites will perform and/or update the necessary Security Risk Assessments and Security Risk Plans.

d. Training. CMOS operational training requirements will be supported by MAJCOM implementation training teams, a System Manager course, a Mobility Training Module, and ATC basic transportation courses. MAJCOMs will conduct on-the-job training (OJT) to satisfy those requirements that fall within the responsibility of the MAJCOM (i.e., qualification, upgrade, special certification, follow-on, etc.). Training tasks and objectives will be determined by application of the Instructional Systems Development (ISD) program IAW AFR 50-8.

System Manager training will involve approximately two weeks of classroom instruction. It will cover all aspects of system administration, system management, user management, data management, trouble shooting, and preventative maintenance and problem reporting.

The Mobility Training Module will provide an advanced training course for transportation and base level logistics plans personnel. The course will be held during the initial state of CMOS deployment to provide additional training in mobility operations. The objective of the course will be to cover advanced topics not covered during the implementation training and to train transportation/logistics personnel on how to train mobility augmentees.

Air Training Command (ATC) basic transportation courses will begin development in FY 93/94. CMOS will be implemented in subject courses at the appropriate ATC center in FY 96. Training requirements for these courses will be determined by the user and submitted to HQ ATC no later than the fourth quarter of FY 92.

Implementation training will be provided at each base prior to CMOS startup. This training will be a joint effort between the MAJCOMs and the CMOS SPO. The SPO schedules activities, the MAJCOM notifies their team, and the team executes the training.

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11. Schedules.

a. **Major Milestones.** Figure 11-1 identifies the major milestones associated with the acquisition, transition, and support schedules of the system.

b. **Contract Deliverable Schedule.** Reference the latest CMOS Monthly Program Status Report for a summary of delivered and pending items.

c. **Support Capabilities.** Figure 11-2 identifies the schedule for acquisition and achievement of initial operational capability (IOC) for the primary computer resource support capabilities.

	CA	SRR	SDR	SSR	PDR	CDR	FCA/PCA
Contract Award	●						
Establish CCB		●					
Update Subsystem Specifications		●					
Submit Subsystem/Segment Design			●				
Establish Functional Baseline			●				
Submit Interface Requirements Specifications				●			
Submit Software Requirements Specifications				●			
Establish Allocated Baseline				●			
Submit Software Test Plan					●		
Submit Software Design Document						●	
Submit Interface Design Document						●	
Submit Software Test Descriptions						●	
Submit Source Code							●
Submit Software Test Reports							●
Submit Computer Systems Operations Manual							●
Submit Software Users Manual							●
Submit Programmers Manual							●
Submit Version Description Document							●
Submit Software Products Specifications							●
Establish Product Baseline							●

Figure 11-1. Major Milestones.

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AS OF: 5 OCT 92

ACTIVITY DESCRIPTION	START	FINISH	1989	1990	1991	1992	1993	1994	1995	1996
CONTRACT AWARD	MAY 89	MAY 89	◄							
INC I	MAY 89	MAR 91	◄——————◆							
INC II	DEC 89	MAR 92	◄—————————————◄							
IPR	MAY 92	MAY 92				◄				
S/W UPGRADE	JUN 92	AUG 93				◄	△			
QOT&E RETEST	SEP 93	OCT 93					△△			
IOC/MS III	FEB 94	FEB 94				◆		△		
IMPLEMENTATION	FEB 94	SEP 97				◆		△		
FOC/MS IV (AD)	JAN 96	JAN 96						◇		△
CONT. TERM/MS V	SEP 97	SEP 97								

Figure 11-2. CMOS IOC Schedule.

12. Appendices.

        A. Acronyms and Abbreviations

        B. Glossary of Terms

        C. List of Key Personnel

        D. Computer Resources Working Group (CRWG) Charter

        E. Risk Management Plan

        F. Detailed System Description

        G. Security Assistance

Appendix A
Acronyms and Abbreviations

ACA	Air Clearance Authority
ACSN	Advance Change Study Notice
ADRSS	Automated Data Reports Submission System
ADP	Automated Data Processing
AFC2S	Air Force Command and Control System
AFLC	Air Force Logistics Command
AFMC	Air Force Materiel Command
AFR	Air Force Regulation
ATC	Air Training Command
AUTODIN	Automatic Digital Network
B-TWRAPS	Base-Transportation Workload Reporting and Productivity System
BLAMES	Base Level AUTODIN Message Extraction System
CALM	Computer Aided Load Manifesting
CAPS	Consolidate Aerial Port System
CAS-B	Combat Ammunition System - Base
CCB	Configuration Control Board
CCP	Containerization Consolidation Point
CDCP	Central Data Collection Point
CDR	Critical Design Review
CI	Configuration Item
CLIN	Contract Line Item Number
CDRL	Contract Data Requirements List
CM	Configuration Management
CMOS	Air Force Cargo Movement Operations System
CMP	Configuration Management Plan
COMPES-B	Contingency Operations/Mobility Planning and Execution System-Base
COMSEC	Communications Security
COTS	Commercial Off-the-Shelf
CRLCMP	Computer Resources Life Cycle Management Plan
CRWG	Computer Resources Working Group
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSU	Computer Software Unit
CSWG	Computer Security Working Group
DAMMS-R	Department of the Army Movement Management-Redesign
DDL	Data Definition Language
DDN	Defense Data Network
DID	Data Item Deliverable
DODD	Department of Defense Directive
DODR	Department of Defense Regulation
DOD-STD	Department of Defense Standard
DTL	Development and Test Laboratory
ECP	Engineering Change Proposal
EDI	Electronic Data Interchange
ESL	Engineering Support Laboratory
ETADS	Enhanced Transportation Automated Data System
FAR	Federal Aquisition Regulation
FCA	Functional Configuration Audit
FQR	Formal Qualification Review
GFE	Government Furnished Equipment
GFS	Government Furnished Software

GSS	Graphics Software System
HHT	Hand Held Terminal
HOST	Headquarters On-line System for Transportation
HWCI	Hardware Configuration Item
ICI	Interactive Communications Interface
ICWG	Interface Control Working Group
IDD	Interface Design Document
IOC	Initial Operational Capability
IE	Information Engineering
IEEE	Institutue of Electrical and Electronics Engineers
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
IOC	Initial Operational Capability
IRS	Interface Requirements Specifications
ISD	Instructional Systems Development
ISRD	Information System Requirements Document
IV&V	Independent Verification and Validation
Kb	Kilobyte
LAN	Local Area Network
LOGMARS	Logistics Applications of Automated Marking and Reading Symbols
MAJCOM	Major Command
Mb	Megabyte
MIL-STD	Military Standard
NDS	Non-developmental Software
OCONUS	Outside the Continental United States
OJT	On the Job Training
OM	Operator's Manual
OPR	Office of Primary Responsibility
ORD	Operational Requirements Document
PC	Personal Computer
PCA	Physical Configuration Audit
PDR	Preliminary Design Review
PMD	Program Management Directive
P^3I	Pre-Planned Product Improvement
RAM	Random Access Memory
RDBMS	Relational Data Base Management System
RTM	Requirements Traceability Matrix
QA	Quality Assurance
QOT&E	Qualification Operational Test and Evaluation
QT&E	Qualification Test and Evaluation
SBSS	Standard Base Supply System
SCCS	Source Code Control System
SDD	Software Design Document
SDL	Software Development Library
SDP	Software Development Plan
SDR	Software Design Review
SMSCRC	Standard Multi-user Small Computer Requirements Contract
SPM	Software Programmer's Manual
SPO	System Program Office
SPS	Software Product Specification
SQE	Software Quality Evaluation
SQL	Structured Query Language
SRR	System Requirements Review
SRS	Software Requirements Specification

SSC	Standard Systems Center
SSR	Software Specification Review
SSDD	System/Segment Design Document
SSS	System/Segment Specification
STD	Software Test Description
STP	Software Test Plan
STR	Software Test Report
TEMP	Test and Evaluation Master Plan
TERMS	Terminal Management System
TMO	Transportation Management Office
TPWG	Test Planning Working Group
TRR	Test Readiness Review
ULANA	Unifed Local Area Network Architecture
UM	User's Manual
UPS	Uninterruptible Power Supply
VGA	Video Graphics Array
VDD	Version Description Document
WCA	Water Clearance Authority

Appendix B

Glossary of Terms

Allocated Baseline: The initially approved documentation describing an item's functional and interface characteristics that are allocated from those of a higher level CI, interface requirements with interfacing configuration items, additional design constraints, and the verification required to demonstrate the achievement of those specified functional and interface characteristics. (MIL-STD-480B)

Approved Change: A change for which approval has been given for incorporation by the applicable configuration control board.

Audits: Configuration audits verify conformance to specifications and other contract requirements. Audits are not reviews. NOTE: Audits differ from reviews in that reviews are conducted on a periodic basis to assess the degree of completion of technical efforts related to identified milestones before proceeding with further technical effort.

Baseline: A configuration identification document, or a set of such documents (regardless of media), formally designated and fixed at a specific time, during a configuration item's life cycle. Baselines, and their approved changes, constitute the current configuration identification.

Baseline Management: Applying technical and administrative direction to designate the documents which formally identify and establish the initial configuration identification at specific points in the life cycle. (MIL-STD-483A)

Class I Change: Changes to baseline specifications and products are designated as Class I when they affect one or more of the following:

    a. Baseline configuration identification.

    b. Technical requirements to include performance reliability and interface characteristics.

    c. Non technical effects such as fees, incentives, cost to government, schedules, and guarantees.

    d. Other items to include effects upon Government Furnished Equipment (GFE), safety, support equipment compatibility, inadequate funding, etc.

Class II Change: Changes not affected by Class I factors which may include documentation only changes, hardware substitutions, and program changes that do not impact cost or schedule and fall within contractual scope.

Computer Software Component (CSC): A functionally or logically distinct part of a CSCI. CSCs may be top-level or lower-level. (AFR 800-14)

Computer Software Configuration Item (CSCI): A configuration item for computer software. (DOD-STD-2167A)

Configuration: The functional and/or physical characteristics of hardware/software as set forth in technical documentation and achieved in a product. (DODD 5010.19)

Configuration Control: The systematic evaluation, coordination, approval or disapproval, and implementation of all approved changes in the configuration of a CI/CSCI after formal

establishment of its configuration identification. (DODD 5010.19)

Configuration Control Board (CCB): A board composed of representatives from program/project functional areas such as engineering, configuration management, procurement, production, test and logistics support, training activities, and using/supporting organizations. This board approves or disapproves proposed changes with each member recording his organization's official position. The program/project manager is normally the board chairman and makes the final decision on all changes unless otherwise directed by command policy. The board issues a directive/request to implement its decision. (AFR 800-14)

Configuration Item (CI): An aggregation of hardware/software, or any of its discrete portions, which satisfies an end-use function and is designated by the Government for configuration management. During development and initial production, CIs are only those specification items referenced directly in the contract (or an equivalent in-house agreement). During the operation and maintenance period, any repairable item designated for separate procurement is a configuration item. (DODD 5010.19)

Configuration Management: A discipline applying technical and administrative direction and surveillance to (a) identify and document the functional and physical characteristics of CIs, (b) audit the CIs to verify conformance to specifications, interface control documents, and other contract requirements, (c) control changes to CIs and their related documentation, and (d) record and report information needed to manage CIs effectively, including the status of proposed changes and the implementation status of approved changes. (DODD 5010.19)

Critical Design Review (CDR): This review will be conducted by the developer for each configuration item when detail design is essentially complete. The purpose of this review will be to determine if the detail design of the configuration item under review satisfies the design requirements established in the configuration item specification, and establishes the exact interface relationships between the configuration item and other items of equipment and facilities. (MIL-STD-1521B)

Deficiencies: Deficiencies consist of two types: Conditions or characteristics in hardware/software which are not in compliance with a specified configuration, or inadequate (or erroneous) configuration identification which has resulted or may result in configuration items not fulfilling approved operational requirements. (DODD 5010.19)

Development Specification: A document applicable to an item below the system level which states performance, interface, and other technical requirements in sufficient detail to permit design, engineering for service use, and evaluation.

Deviation: A specific written authorization, granted prior to the manufacture of an item, to depart from a particular performance or design requirement of a specification, drawing, or other document for a specific number of units or a specific period of time. A deviation differs from an engineering change that an approved engineering change requires corresponding revision of the documentation defining the affected item, whereas a deviation does not contemplate revision of the applicable specification or drawing. (MIL-STD-480B)

Documentation: The specifications, reports, plans, and procedures used to document and support computer programs.

Engineering Change: An alteration in the approved configuration identification of a CI under development, delivered, or to be delivered. Changes may be Class I or Class II. (MIL-STD-480B)

Formal Qualification Review (FQR): The FQR is a review to ensure the quality control tests have been accomplished verifying system performance according to specification requirements. An FQR is held for each new design. (MIL-STD-1521B)

Functional Baseline (FBL): The initially approved documentation describing a system's or item's functional characteristics and the verification required to demonstrate the achievement of those specified functional characteristics. (MIL-STD-480B)

Functional Configuration Audit (FCA): Formally validates the development of a CI has been completed satisfactorily and the item has achieved the performance and functional characteristics specified in the functional or allocated configuration identification. Includes a review of the completed operation and support documents. (AFR 65-3)

Physical Configuration Audit (PCA): Technical examination of a designated CI to verify the item "as built" conforms to the technical documentation which defines it. (MIL-STD-1521B)

Preliminary Design Review (PDR): Conducted for each CI or aggregate of CIs to: (1) evaluate the progress, technical adequacy, and risk resolution (on a technical, cost, and schedule basis) of the selected design approach; (2) determine its compatibility with performance and engineering requirements of the HWCI development specification; (3) evaluate the degree of definition and assess the technical risk associated with the selected manufacturing processes; and (4) establish the existence and compatibility of the physical and functional interfaces among the CI and other equipment, facilities, software and personnel. For CSCIs, PDR focuses on: (1) the progress, consistency, and technical adequacy of the selected top-level design and test approach, (2) compatibility between software requirements and preliminary design, and (3) the preliminary version of the operation and support documents. (MIL-STD-1521B)

Product Baseline (PBL): The initially approved documentation describing all of the necessary functional and physical characteristics of the CI, any required joint and combined operations interoperability characteristics of a CI (including a comprehensive summary of the other service(s) and allied interfacing CIs or systems and equipment), and the selected functional and physical characteristics designated for production acceptance testing and tests necessary for support of the CI. (MIL-STD-480B)

Software Reliability: The probability that a computer program configuration item will perform its intended function for a specified interval under stated conditions.

Specification: A document intended primarily for use in procurement, which clearly and accurately describes the essential technical requirements for items, materials, or services, including the procedures by which it will be determined that the requirements have not been met. (DODD 4120.3)

Specification Change Notice (SCN): This document is used to propose, transmit, and record changes to a specification. In the proposal or preliminary form, prior to approval, the SCN supplies copies of the pages containing the proposed changes. (MIL-STD-480B)

System: A composite of equipment, skills, and techniques capable of performing and/or supporting an operational (or non-operational) role. A complete system includes all equipment-related facilities, material, software services, and personnel required for its operation and support to the degree it can be considered a self-sufficient item in its intended operational (or non-operational) environment. (MIL-STD-480B)

System Specification: A document which states the technical and mission requirements for a system as an entity, allocates requirements to functional areas (or configuration items), and

defines the interfaces between or among the functional areas.

System Design Review (SDR): Evaluates optimization, correlation, completeness, and risks associated with the allocated technical requirements. Reviews the system engineering process which produced the allocated technical requirements and the engineering planning for the next phase of effort. Reviews basic manufacturing considerations and addresses planning for production engineering in subsequent phases. Conducted when system characteristics are defined and CIs are identified. (MIL-STD-1521B)

System Requirements Review (SRR): Ascertains the adequacy of the contractor's effort in defining system requirements. Conducted when a significant portion of the system functional requirements has been established. (MIL-STD-1521B)

Version Description Document: This data item shall be used to accompany changes to an approved and released computer program. Its purpose is to identify the changes made and the exact version of a computer program to be delivered.

Waiver: A written authorization to accept a configuration item or other designated items, which during production or having been submitted for inspection, are found to depart from specified requirements, but nevertheless are considered suitable for use "as is" or after rework by an approved method. (DODD 5010.19)

Appendix C

List of Key Personnel

NAME	GRADE	ORGANIZATION	PHONE
Joseph J. Berardino	Colonel	SSC/LGT	416-3166
James E. Wakely	Major	SSC/LGTT	416-5709
Thomas E. Maher	GS-13	SSC/LGTTE	416-2534
Walter F. Dzialo	GS-12	SSC/LGTTF	416-2538

Appendix D

CMOS
COMPUTER RESOURCES WORKING GROUP (CRWG)
CHARTER

1. Background. General authority for forming a Computer Resources Working Group (CRWG) is contained in AFR 800-14, which defines computer resources as *"the totality of computer hardware, computer software, and associated personnel, documentation, supplies, and services."* This Charter governs the activities and conduct of CMOS CRWG.

1-1. References. The following references apply to the CRWG:

    a. AFR 800-14, Life Cycle Management of Computer Resources in Systems, 29 September 1986.

    b. HQ USAF PMD 5272(4)/ PE #38610F, dated 5 December 1986, as revised 5 June 1992.

1-2. Agreements. The following agreements between participating commands and agencies pertain to the membership or operation of CMOS CRWG:

2. Purpose. The CMOS CRWG is a management policy advisory group composed of members from each organization that is involved with the life cycle management of computer resources in CMOS program. The purpose of the group is to provide assistance and advice to the CMOS Program Manager in all aspects of the program involving computer resources.

3. Scope. The CMOS CRWG will address life cycle and program management of computer resources involved in the development of CMOS, and the acquisition of the hardware, communications, and software to support Air Force base level TMO.

4. Organization. The CRWG will be chaired by CMOS Program Manager, SSC/LGTT. Each of the organizations listed below will provide representatives to the CRWG. Each organization should appoint a primary and alternate member. Members are responsible for advising the Recorder when the primary or alternate member changes and/or when the alternate will attend a given meeting in place of the primary.

ORGANIZATION	STATUS
SSC/LGTT	Chairperson
SSC/LGTT	Recorder
SSC/AQA	Member

4-1. Attendance of Technical Advisors. Technical advisors will be specifically invited by the Recorder when the Chairperson deems their attendance essential.

4-2. Attendance of Contractors. Contractors will be allowed to attend CRWGs only with the prior approval of the CRWG Chairperson. Contractors may be excluded from attending certain portions of any given CRWG. When contractors attend CRWGs, they will function in an advisory capacity only; they will not be allowed to vote on program management policies.

5.   **Responsibilities.** The following responsibilities, products and tasks of the CRWG and its officers are assigned according to AFR 800-14:

5-1.   Chairperson. The CRWG Chairperson will:

   a. Serve as the primary point of contact on life cycle management matters for the CMOS program.

   b. Serve as the CRWG's voice to the CMOS program management staff on computer resource life cycle management matters.

   c. Coordinate with other CMOS working groups as necessary (e.g., Test Plan Working Group (TPWG)).

   d. Convene the CRWG as required to revise CMOS CRLCMP or provide technical advice.

5-2.   Recorder. The CRWG Recorder (SSC/LGTT) will:

   a. Schedule CRWG meetings called by the Chairperson and notify members.

   b. Ensure minutes are taken and verify their accuracy.

   c. Serve as the membership's primary point of contact for monitoring action items, and passing recommendations to the program office.

   d. Establish agendas for meetings based on recommendations from the members and direction of the Chairperson.

   e. Prepare, publish, distribute, and update the CRWG charter.

   f. Prepare, publish, and distribute minutes of the CRWG.

5-3.   Members. The CRWG Members will:

   a. Serve as their organizations' primary points of contact on life cycle management matters.

   b. Assist in the preparation and review of management documents for the CMOS program (e.g., the CRLCMP).

   c. Brief their organizations' program management issues and concerns to the CRWG as necessary.

   d. Ensure their organizations are fully aware of any CMOS requirements that may impact the organization.

   e. Respond to action items assigned during CRWGs.

   f. Submit proposed agenda items to the CRWG Recorder.

5-4.   Advisors. Advisors to the CRWG will:

   a. Provide technical advice on issues within their areas of expertise.

b. Brief the CRWG as required on topics within their areas of expertise.

5-5. Products and Tasks. The CRWG plays a major role in the management of computer resources in the CMOS system. The CRWG will:

a. Write, update as necessary, and monitor compliance with the CRLCMP.

b. Monitor compliance of the program with computer resources policy, plans, procedures, and standards.

c. Select a software support concept and document it in the CRLCMP.

(1) Describe the support concept in sufficient detail to account for system peculiarities and existing conditions.

(2) Categorize each software functional requirement as either a mission or system function.

(3) Further categorize each CSCI as either a mission or system CSCI after the allocated baseline is authenticated.

d. Actively participate in all aspects of the program involving computer resources (program management reviews, design reviews, audits, etc.).

e. Advise the program manager in all areas relating to the acquisition and support of computer resources.

f. Integrate software test activities with the overall test program through a TPWG.

g. Assist the program manager to identify, assess, and control risks associated with computer resources.

h. Assess how much and what type of flexibility and spare capacity (to allow for growth during development and modification during system deployment) is cost-effective and document recommendations in the CRLCMP.

i. Analyze existing software support facilities and tools for modification or upgrade when evaluating support resources alternatives.

j. Analyze inter service support alternatives along with other support concepts.

k. Coordinate the application of computer security concepts and guidance to the system.

l. Develop alternatives for computer resources life cycle support.

(1) Develop a preliminary allocation of software support responsibility.

(2) Study the potential for organic and contractor support.

(3) Identify candidate organizations for performing software support.

m. Define the appropriate scope of IV&V and develop a recommended approach.

n. Evaluate the use of standard equipment, high order languages, instruction set architectures, and interfaces.

o. Identify anc prioritize the required software quality factors such as interoperability, portability, flexibility, usability, reusability, maintainability, integrity, reliability, correctness, testability, and efficiency.

6. Procedures. The CMOS CRWG will be conducted in accordance with the following procedures.

6-1. Meetings. CRWG meetings will be held at the call of the CRWG Chairperson and at other times as deemed appropriate. CRWG members may request a meeting by submitting proposed agenda items to the CRWG Recorder. When a CRWG meeting is anticipated, the members should be asked to propose agenda items. All the items on the agenda should be sent to the members far enough in advance of the CRWG meeting to obtain input from the member organizations. Each organization will plan and fund for their participation at the meetings. The CRWG meeting may be hosted by various organizations as agreed to by the CRWG.

6-2. Action Items. The CRWG is an advisory body to the program manager. The program manager is responsible for the acquisition management of the system, including computer resources. As the Chairperson, the program manager will assign management issues as action items to members of the CRWG for resolution. Those issues may also be brought before the CRWG for resolution. If the CRWG cannot resolve an issue, it must notify the program manager who is still responsible for resolving the issue through other means such as program reviews, senior level steering committees, or direct contact with command Office of Primary Responsibility (OPR).

Appendix E

Risk Management Plan

A Risk Management Plan is being developed for CMOS due to the plan to change hardware
platforms for the Host Processor software and is due to be completed by 26 Feb 1993.

Appendix F

Detailed System Description

Refer to the Final System/Segment Design Document, Change 02, Increment II, dated 13 December 1990, for a detailed description of CMOS processors and CSCIs.

Appendix G

Security Assistance

This appendix is not applicable to the CMOS Program. There are currently no plans for sale of CMOS technology to foreign countries.